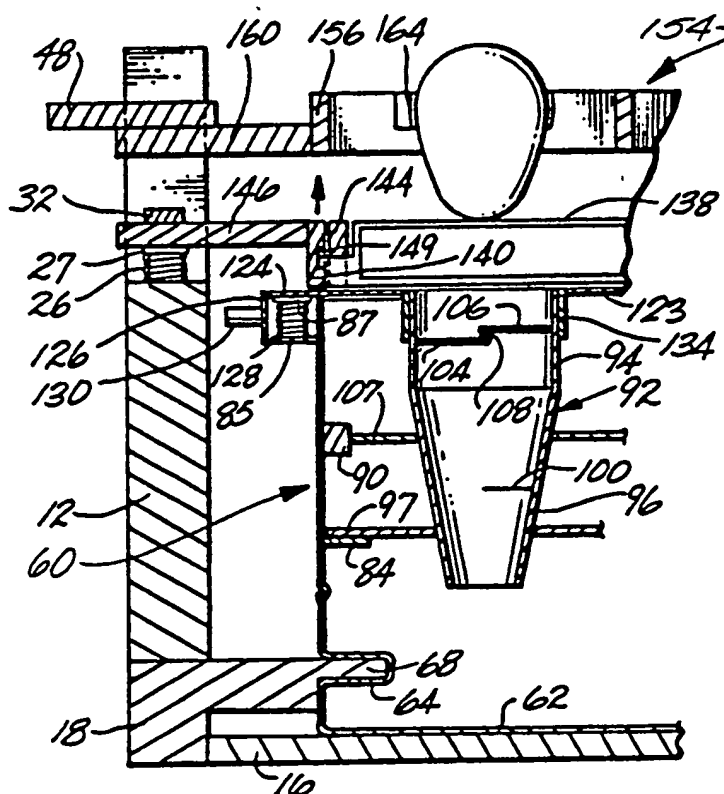


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**(54) Title:** MECHANICAL EGG BREAKER AND SEPARATOR**(57) Abstract**

An apparatus for rapidly breaking and separating eggs. The apparatus comprises an egg holder (154) holding a plurality of eggs stationary in a select number of rows. A pair of contiguous knife blades (138, 142) are positioned below each row of eggs. The knife blades are movable from a lower position below the eggs to an upper position wherein the knife blades break the shells of the eggs. The knife blades are movable horizontally to a spaced-apart position to allow the egg contents to drain the knife blades. A receptacle (60) is provided for receiving the egg contents. A hollow cone (92) with a depressible collar (120) is preferably positioned below each egg to receive the egg contents. The collar (120) can be depressed to allow the egg whites to overflow the cones into the receptacle (60) and only the egg yolks are retained within the cones.



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## MECHANICAL EGG BREAKER AND SEPARATOR

### Field of the Invention

15 The present invention is directed to an egg breaking apparatus and more particularly to an apparatus for simultaneously breaking and separating a plurality of eggs for use in commercial food preparation.

### Background of the Invention

20 Commercial bakeries, hospitals, restaurants and others involved in the preparation of food on a commercial scale typically break eggs by hand. When a substantial number of eggs is involved, as is often the case in commercial food preparation, such procedure can be very time consuming. If separation of egg yolk from the  
25 egg white is also required, the time involved is even greater. Accordingly, a need exists for a means for rapidly breaking a plurality of eggs and for separating the egg yolks from the egg whites.

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### Summary of the Invention

In accordance with the invention, there is provided an apparatus for rapidly breaking eggs. The apparatus comprises an egg holder for holding a plurality of eggs

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1 in an array. Knife means are provided for breaking the  
shells of eggs held by the egg holder to discharge the  
contents of the eggs. The apparatus further comprises  
5 a receptacle for receiving the discharged contents of  
eggs broken by the knife means.

The knife means preferably comprise a pair of gener-  
ally horizontally extending contiguous knife blades are  
positioned below the egg holder. The knife blades are  
movable vertically from a lower position spaced-apart  
10 from the egg holder and an upper position sufficiently  
close to the egg holder for the knife blades to contact  
and break an egg held by the egg holder. The knife  
blades are movable horizontally from the contiguous  
position to a spaced-apart position to allow contents of  
15 the broken eggs to drain between the knife blades.

The apparatus preferably comprises means for sup-  
porting the egg holder and knife blades at positions  
above the receptacle and spring means for biasing the  
knife blades toward the upper position for supplying a  
20 force for breaking the eggs. Means for releasably main-  
taining the knife blades in the lower position can be  
provided to prevent the spring means from acting on the  
knife blades until desired.

A preferred apparatus also comprises means for  
25 separating the egg yolks from the whites of the eggs  
which have been broken by the knife blades. A preferred  
means for separating the egg yolks from the egg whites  
comprises a hollow cone having an open top positioned  
below each egg held by the egg holder for receiving the  
30 contents of the egg when broken by the knife blades.  
Each cone preferably has an interior volume about equal  
to the volume of an egg yolk. A cylindrical collar is  
preferably fitted around the cone and extends above the

1 cone. When an egg is broken above a cone, the contents  
of the egg drain into the cone and collar. The collar  
can be depressed to allow the egg white to gently over-  
5 flow the cone into the receptacle so that only the egg  
yolk is retained within the cone.

In a more preferred apparatus, the cones have an  
openable bottom and the receptacle is subdivided into an  
upper chamber in which egg whites overflowing the cones  
collect and a lower chamber into which egg yolks retained  
10 by the cones can be released.

A particularly preferred apparatus comprises an  
egg-holder grid comprising a plurality of egg holders  
arranged in a select number of rows, preferably six rows  
of five egg holders for holding 30 eggs. A knife grid is  
15 positioned below the egg-holder grid and comprises a pair  
of contiguous knife blades below each row of egg holders.  
The knife grid is movable from a lower position spaced-  
apart from the egg-holder grid to an upper position  
sufficiently close to the egg-holder grid for the knives  
20 to break eggs held by the egg holders. At least one  
knife of each pair is movable horizontally to a spaced-  
apart position so that the contents of eggs cracked by  
the knives when in the contiguous position can drain  
between the knife blades when moved to the spaced-apart  
25 position.

The apparatus further comprises a cone assembly  
which is fitted into the receptacle. The cone assembly  
comprises a plurality of cones positioned below the egg  
holders, each cone having an open top, an openable bottom  
30 and a volume about equal to the volume of an egg yolk.  
The cones extend through an intermediate floor which  
subdivides the interior of the receptacle into an upper

1 chamber and a lower chamber. Egg whites overflowing the  
cone collect in the upper chamber and egg yolks retained  
by the cone can be released through the bottom of the  
cone into the lower chamber.

5 A collar grid is positioned between the knife blades  
and the cone assembly. The collar grid comprises a gen-  
erally cylindrical collar which is snugly fitted around  
each cone of the cone assembly. The collar grid is  
10 afforded vertical movement between an upper position  
wherein the collars extend above the cones and, with  
the cones, receive the entire contents of the broken  
eggs, and a lower position wherein the collars are at or  
below the upper edges of the cones and allow the egg  
15 whites to gently overflow the cones and collars, thereby  
avoiding unbalancing and resultant breakage of the yolk  
retained within the cone or commingling of yolks and egg  
whites.

The present invention further comprises a method for  
simultaneously breaking a plurality of eggs. The method  
20 comprises holding a plurality of eggs in a generally  
stationary position in a select number of generally  
horizontal rows. A pair of contiguous knife blades are  
positioned below each row of eggs. The knife blades are  
moved upwardly with sufficient force to break the shells  
25 of the eggs. At least one knife blade of each pair is  
then moved horizontally away from the other knife blade  
to allow the contents of the egg to drain between the  
knife blades. The contents of the broken eggs are re-  
ceived in a receptacle positioned below the knife blades.

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1           The method preferably comprises the step of separa-  
ting the egg whites from the egg yolks of eggs broken by  
the knife blades. Such separation is preferably accom-  
5           plished by positioning a cone having an open top and a  
volume about equal to the volume of an egg yolk below  
each egg. A depressible cylindrical collar is prefer-  
ably fitted around the cone and extends above the cone.  
The cone and collar receive the contents of the broken  
egg. The collar is depressed allowing the egg white to  
10          overflow the cone and collar into the receptacle and only  
the egg yolk is retained by the cone.

          It is further preferred that the cone have an open-  
able bottom and that the receptacle is subdivided into an  
upper chamber and a lower chamber so that egg whites  
15          overflowing the cones collect in the upper chamber and  
egg yolks retained in the cones are released into the  
lower chamber through the openable bottom.

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Brief Description of the Drawings

These and other features and advantages of the present invention will be better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings wherein:

FIG. 1 shows an isometric drawing of the U-frame which supports the other components of the invention.

FIG. 1A shows a cut-away side view of a latch mechanism of the U-frame of FIG. 1.

FIG. 1B shows a front view of the latch mechanism of FIGS. 1 and 1A.

FIG. 2 shows an isometric drawing of the egg-holding tank which slides onto the U-frame of FIG. 1.

FIG. 3 shows an isometric drawing of the egg-holder grid which fits into the slots in the U-frame of FIG. 1.

FIG. 3A shows a top view of one of the holders in the egg-holder grid of FIG. 3.

FIG. 4 shows an isometric drawing of the knife grid which also fits into the slots in the U-frame of FIG. 1.

FIG. 4A shows a top view of a section of the knife grid of FIG. 4.

FIG. 4B shows a side view of a section of the outside, stationary frame of the knife grid of FIGS. 4 and 4A.

FIG. 4C shows a side view of a section of the inside, sliding frame of the knife grid of FIGS. 4 and 4A.

FIG. 5 shows an isometric drawing of the collar grid which fits over the top edge of the holding tank of FIG. 2.

FIG. 6 shows an isometric drawing of the cone insert which fits into the holding tank of FIG. 2.



1           FIG. 6A shows a side view of the rotating trap-door  
present in each of the cones in the cone insert of FIG. 6  
in the closed position.

5           FIG. 6B shows a side view of the rotating trap-door  
of FIG. 6A in the open position.

FIG. 6C shows a side view of the activating mechanism  
for the rotating trap-doors of FIGS. 6A and 6B in the  
closed position.

10          FIG. 6D shows a side view of the activating mechanism  
of FIG. 6C in the open position.

FIG. 7 shows a side view of the initial position of  
an egg in the holders of FIGS. 3 and 3A with respect to  
the knife grid of FIGS. 4 and 4A.

15          FIG. 8 shows a side view of an intermediate position  
in the egg-breaking process where the knife grid of FIGS.  
4 and 4A has moved up to penetrate the egg's shell.

FIG. 9 shows a side view of the final position in  
the egg-breaking process where the associated blades of  
the knife grid of FIGS. 4 and 4A have been slid apart.

20          FIG. 10A shows a cut-away side view of a portion of  
the components of the invention in the initial position of  
an egg-breaking process.

25          FIG. 10B shows the same cut-away side view as FIG.  
10A, but with the components of the invention in the  
final position of an egg-breaking process.

FIG. 10C shows the same cut-away side view as FIG.  
10A, but with the components of the invention in a position  
where the collar grid of FIG. 5 is depressed.

30          FIG. 10D shows the same cut-away side view as FIG.  
10A, but with the components of the invention in a position  
where the rotating trap doors are open as shown in FIG.  
6B.

1     Detailed Description

      The present invention pertains to a mechanical egg  
breaker and/or separator which utilizes a dual-motion  
knife to allow a large number of eggs to be efficiently  
5     and rapidly cracked and separated at one time. The  
following is a description of a preferred embodiment of  
the invention shown in the drawings.

      With reference to FIG. 1, a U-shaped frame 10 serves  
as the basic support for the other components of the egg  
10    breaker. The frame 10 comprises two generally vertical  
standards 12, each supported by a generally horizontal  
base segment 18. The standards 12 are rigidly connected  
at their bottom center by a generally horizontal brace 16.

      Each vertical standard 12 has a generally vertical,  
15    rectangular slot 22 at its upper end. Positioned at  
the bottom of each slot 22 is a generally vertical coil  
spring 26. Attached to the upper ends of each coil  
spring 26 is a disc 27 to provide a surface for receiving  
knife grid 136, shown in FIGS. 4 and 4A described in  
20    detail herein.

      Associated with each slot 22 and coil spring 26 is a  
latch mechanism 30 for releasably maintaining the coil  
spring 26 in a compressed state. Front and side details  
of latch mechanism 30 are shown in FIGS. 1A and 1B. Each  
25    latch mechanism 30 comprises a tang 32 which is mounted  
in a rectangular hole 34 in the standard 12 adjacent the  
slot 22. A pin 38 is rigidly mounted and extends across  
hole 34 and is embedded in the opposite walls of the  
standard 12 defining the hole 34.

30    The tang 32 is rotatably mounted on pin 38 and is  
afforded angular movement from a first position wherein  
the tang is completely disposed within hole 34 and a  
second position wherein the tang 32 protrudes into  
slot 22.

1           The latch mechanism 30 is positioned so that, when  
the tang 32 protrudes into the slot 22, the underside of  
tang 32 engages the extension 146 of knife grid 136 which  
rests on disk 27 and maintains the coil spring 36 in a  
5           compressed state. Movement of tang 32 to the first  
position releases disk 27 and allows coil spring 26 to  
expand. Movement of tang 32 is controlled by an activa-  
tion rod 46 which is fixedly attached to tang 32 and  
extends in a direction away from slot 22.

10           A slot blocker 48 is mounted by hinge 47 to the side  
of each standard 12 and is afforded rotatable movement  
between an open position extending away from slot 22 and  
a closed position extending into and blocking the open  
end of slot 22.

15           Alternatively, slot blocker 48 can be mounted on  
the top of vertical standard 12. However, such an embodi-  
ment requires a locking mechanism to prevent upward  
movement of slot blocker 48 when the slot blocker 48  
extends into slot 22 and when an upward force is applied  
20           to it.

          With reference to FIG. 2, a holding tank 60 is shown  
which serves as a receptacle for the contents of the eggs  
broken by use of this invention. Holding tank 60 has a  
groove 64 along either side which enables holding tank 60  
25           to slide onto frame 10 along tracks 68 thereby providing  
greater stability to the holding tank. Holding tank 60  
is rectangular in shape, and, in an embodiment of the  
invention, is sufficiently large to catch the falling  
contents of thirty eggs arranged in five rows of six  
30           eggs. Such capability is preferred because eggs are  
often packaged in such a configuration. It would be  
appreciated by one of ordinary skill in the art that any

1 number of shapes and sizes of holding tank 60 could be  
adopted by the invention to handle any number of eggs.  
Holding tank 60 has a removable bottom panel 62 to facil-  
itate cleaning.

5 Holding tank 60 has an intermediate flange 84  
extending about the interior of holding tank 60 at a  
position above the bottom panel 62. A top flange 85  
extends around the exterior surface near the top edge of  
holding tank 60. Attached to the upper surface of top  
10 flange 85 are several springs 128. Discs 87 are attached  
to the upper ends of springs 128, to provide a surface  
for receiving collar grid 120, shown in FIG. 5 and  
described in detail later.

Holding tank 60 comprises a rectangular hole 86 in  
15 one side at a position between the intermediate flange 84  
and the top flange 85. Near the bottom corner of holding  
tank 60, a "pop-out" spout 80 with attached cap 82 is  
provided to allow for emptying the lower portion of hold-  
ing tank 60. A second "pop-out" spout 81 is positioned  
20 just above the intermediate flange.

With reference to FIG. 6, a cone insert 88 is shown  
which fits into the holding tank 60 of FIG. 2. Cone  
insert 88 comprises of 30 generally identical, hollow  
cones 92 arranged in a five-by-six pattern. The cones  
25 are mounted in a generally rectangular frame 90 and are  
rigidly interconnected by rods 107.

Cones 92 have a generally cylindrical upper section  
94 and a generally conical lower section 96. The lower  
sections 96 of cones 92 fit into and are fixedly mounted  
30 in corresponding circular holes in a generally horizontal  
intermediate floor 97, below frame 90. Cone insert 88 is  
fitted inside holding tank 60 with the intermediate floor  
97 resting upon intermediate flange 84 and frame 90

1 fitted snugly against the side walls of holding tank 60.  
Intermediate flange 84 is positioned so that when cone  
insert 88 is placed in holding tank 60, the bottom edges  
of the cones 92 are above the floor of holding tank 60,  
5 and the top edges of cones 92 are generally level with  
the top edge of holding tank 60. The intermediate floor  
divides the interior of the holding tank 60 into an  
upper chamber above the intermediate floor 97 and a  
lower chamber below intermediate floor 97.

10 With reference to FIGS. 6A and 6B, each cone 92  
comprises a trap-door mechanism 102 positioned at about  
the midpoint of its upper section 94. The trap-door  
mechanism 102 comprises a fixed generally semi-circular  
plate 104 and a rotatable generally semi-circular plate  
15 106. A rotatable rod 108 extends through each cone 92 in  
a row of cones at about the elevation of the fixed plate  
104. The rotatable semi-circular plate 106 is rigidly  
attached along the underside of its straight edge to rod  
108. The ends of rod 108 protrude from the cones 92 at  
20 the end of the row and are fitted with a cap 110, which  
is shown in side view in FIGS. 6C and 6D. Attached to  
each cap 110 is a needle-eyed spoke 112 which extends up  
and to the left at a 45° angle, as viewed in FIG. 6C,  
when the trap-door mechanism 102 is in the closed posi-  
25 tion, as shown in FIG. 6A. In the closed position,  
rotatable plate 106 partially overlaps fixed plate 104,  
preventing leakage at the trap-door.

Spokes 112 are coupled to rod 114, which is con-  
nected at about its center by a generally vertical elbow  
30 116 to a generally horizontal screw-in knob 118, which  
extends from elbow 116 through rectangular hole 86 to the  
exterior of holding tank 60. Knob 118 is preferably  
removable so that cone insert 88 can be lifted out of  
holding tank 60 for easy cleaning.

1           Sliding knob 118 to the right, as shown in FIG. 6D,  
results in rod 108 being rotated 90° and rotatable plate  
106 being moved into the open position, as shown in FIG.  
6B.

5           When knob 118 is moved to the right, spokes 112  
travel angularly, the ends of spokes moving through an  
arc. To accommodate the movement of the spokes 112,  
spokes 112 comprise an elongated needle-eyed opening 111  
10 through which rod 114 extends. Rod 114 comprises stops  
113 on either side of the opening 111 to assure movement  
of spokes 112 when rod 114 is moved. The needle-eyed  
openings 111 allow rod 114 to be moved in a generally  
straight line while allowing angular movement of the  
spokes.

15           About midway down the lower section 96 of cone 92,  
pin 100, or its equivalent, extends away from the wall to  
selectively break open an egg yolk passing through the  
cone 92 to allow for easier decanting of the egg yolks  
through pop-out spout 80.

20           With reference to FIG. 5, a collar grid 120 is  
positioned above the cone insert 88, and when mounted on  
the holding tank, rests on the discs 87 attached to  
springs 128, shown in FIG. 2. The collar grid 120 com-  
25 prises 30 cylindrical, hollow sections arranged in a  
five-by-six pattern connected to one another and to a  
frame 122 by rods 123. The frame 122 is generally  
L-shaped having a generally horizontal upper side wall  
124 and a generally vertical outer side wall 126. When  
in place above holding tank 60, the upper side wall 124  
30 rests on discs 87 attached to springs 128. The dimensions  
of collar grid 120 are such that outer side wall 126  
extends closely around top flange 85 when the collar grid  
120 is depressed against the force of springs 128. Push

1 tabs 130 are attached to opposite sides of frame 122 to  
aid in depressing the collar grid 120. For better access  
from the front, push tabs 130 are positioned on the sides  
of frame 122 adjacent vertical standards 12.

5 When collar grid 120 is at rest on the discs 87,  
i.e., when springs 128 are not compressed, the top edges  
of cones 92 slightly overlap the lower edges of hollow  
cylinders 134. The inner diameter of hollow cylinders  
134 is just slightly larger than the outer diameter of  
10 the upper section of cones 92 so that, when collar grid  
120 is depressed, hollow cylinders 134 slide down along  
the outside of cones 92. The height of hollow cylinders  
134 is about half the length of the upper section 94 of  
cone 92 so that when collar grid 120 is fully depressed,  
15 the lower edges of hollow cylinders 134 do not interfere  
with the operation of rod 108 in activating the trap-doors.

With reference to FIG. 4, a dual-action knife grid  
136 for breaking the eggs is provided. As shown knife  
grid 136 comprises a stationary frame 140 and a movable  
20 frame 144. Five stationary knife blades 138 having a  
generally L-shaped cross-section are fixedly attached at  
their ends to stationary frame 140. Five sliding knife  
blades 142, also having a generally L-shaped cross-section,  
are fixedly attached to a movable frame 144. Frame 140  
25 comprises extensions 146 which extend into slots 22 in  
standards 12 and rest on coil springs 26.

The sliding knife blades 142 are positioned initially  
contiguous to the stationary knife blades 138. To accom-  
plish this positioning, frame 144 is dimensioned to fit  
30 inside frame 140 and comprises notches 150 adjacent the  
sliding knife blades, as shown in the side view of FIG.  
4C, which engage corresponding notches in the ends of  
stationary knife blades 137 adjacent frame 140.

1           To maintain the positioning of frame 140 relative to  
frame 144, frame 144 has cylindrical projections 145 as  
shown in the side view of FIG. 4C, which fit into corres-  
ponding vertical grooves 147 of frame 140, as shown in  
5           the side view of FIG. 4B. The vertical grooves 147  
extend from the top edge of frame 140 to a horizontal  
groove 149. The cylindrical projections 145 are afforded  
slidable movement within horizontal groove 149. Vertical  
grooves 147 are located about midway between the two  
10          positions to be assumed by the cylindrical projections  
145 during operation of the knife grid 136. Attached to  
one side of frame 144, away from standards 12 is pull tab  
152, to facilitate the sliding of movable frame 144  
within stationary frame 140.

15          The top view of FIG. 4A shows the stationary knife  
blades 138 and the sliding knife blades 142 in their  
initial contiguous position. From this position, movable  
frame 144 can be moved to the right, as shown, and there-  
by causing the sliding knife blades 142 to move away from  
20          the stationary knife blades 138 into a spaced-apart  
position. The space between the stationary and sliding  
knife blades provides room for the contents of an egg  
broken by the knife blades to drain out. In a particu-  
larly preferred embodiment, the vertical sections of  
25          both stationary knife blades 138 and sliding knife blades  
142 comprise openings 143 to make an additional pathway  
through which the egg contents can drain. It would be  
appreciated by one of ordinary skill in the art that this  
could be accomplished in a variety of ways. One possible  
30          alternative embodiment would be to make the leading edge  
of the knife blades a taut wire.



1           With reference to FIG. 3, an egg-holder grid 154 is  
shown which transfers eggs to the egg breaker and holds  
them in place during the egg breaking process. Egg-holder  
grid 154 comprises a rectangular, external frame 156,  
5       inside of which is a wire grid of 30 generally square  
compartments 158 arranged in a five-by-six pattern and  
open at top and bottom. On opposite sides of frame 156..  
are attached bars 160 which extend into vertical, rec-  
tangular slots 22 of standards 12 and are held in place  
10       by slot blockers 48. The bars 160 also provide a conven-  
ient way to hold egg-holder grid 154 when lowering it  
over a commercial flat of eggs to pick up the eggs for  
transfer to the egg breaker.

FIG. 3A shown a top view of one of the square wire  
15       compartments 158. Flexible egg holders 164 are attached  
to the inside walls of compartments 158 near the bottom  
to grip the eggs during the egg breaking process. Holders  
164 are flexible so that they can hold different sized  
eggs. As an alternative embodiment, holders 164 could be  
20       attached to two opposite inside corners of compartments  
158 so that they could be more securely attached at two  
points.

To prepare the invention for operation, holding tank  
60 is slid onto frame 10 using grooves 64 and tracks  
25       68. If the eggs are to be separated into yolks and  
whites as well as broken, cone insert 88 and collar grid  
120 are engaged in place. If only breaking is required,  
cone insert 88 and collar grid 120 need not be used.  
Cone insert 88 is assembled in holding tank 60 with knob  
30       118 unassembled. Once in place, knob 118 is assembled,  
extending through rectangular hole 86, and then slid all  
the way to the left, as shown in FIG. 6C. In such a  
position, the trap-door mechanisms 102 are closed.

1 Collar grid 120 is then placed over the top edge of  
holding tank 60 so that all the hollow cylinders 134 fit  
around their corresponding cones 92.

5 Knife grid 136 is positioned in frame 10 so that  
extensions 146 fit into slots 26. Knife grid is pressed  
downwardly to compress coil springs 26, which are then  
held in a compressed state by latch mechanisms 30. Collar  
grid 120 is also depressed.

10 Initially, frame 144 is in a position wherein the  
stationary and sliding knife blades are contiguous.  
Egg-holder grid 154 is lowered over a commercial flat of  
30 eggs, which are gripped by holders 164. Egg-holder  
grid 154 is then placed over knife grid 136 so that bars  
160 fit into slots 22 and then it is locked in place by  
15 slot blockers 48 which are rotated into slots 22. The  
eggs in egg-holder grid 154 are positioned in contact  
with the knife grid 136, as shown in FIG. 7, and centered  
over corresponding hollow cylinders 134 and cones 92.

20 With reference to FIGS. 10A through 10D, the egg  
breaking and separating process can now be described  
starting from the position shown by FIG. 7. To initiate  
the process, spring-activation rod 46 is lifted until  
tangs 32 release coil springs 26 which drive the knives  
of the knife grid 136 up into the eggs, as shown in FIG.  
25 8. Collar grid 120 is also released. The upward move-  
ment of knife grid 136 is halted when extensions 146  
engage bars 160, held in place by slot blockers 48.

30 The sliding knife blades 142 are immediately slid  
away from stationary knife blades to the spaced-apart  
position, as shown in FIG. 9, to allow the egg contents  
to drain into hollow cylinders 134 and cones 92.

35 The trap door mechanism of the cones is initially  
closed, causing the egg contents to fill the portion of  
the cones 92 above the trap door mechanism 102 and the  
hollow cylinders 134 which extend above the cones 92.

1 The portion of the cones 92 above the trap-door mechanism  
102 has a volume about equal to the volume of a typical  
egg yolk. Collar grid 120 is then depressed. This  
5 results in egg whites overflowing onto the intermediate  
floor of cone insert 88 and accumulating in the upper  
chamber of holding tank 60 where they can be decanted  
through spout 81.

Once the egg whites have overflowed the cones 92 and  
only the yolk remains in the portion of the cones 92  
10 above the trap-door mechanism 102, knob 118 is moved to  
the right, as shown in FIG. 6D, to activate the trap-door  
mechanism 102, allowing the egg yolks to slide down the  
cone 92. The egg yolks are broken open by pin 100, and  
drain into the lower portion of holding tank 60, where  
15 they can be decanted through spout 80.

After swinging slot blockers 48 out of the slots 22,  
knife grid 136 and egg-holder grid 154 can be lifted out  
of slots 26, at the same time, and cleaned of shells and  
shell fragments. By reloading egg-holder grid 154 and  
20 returning the knife grid 136 to its initial position, the  
process can be repeated until the capacity of holding  
tank 60 is reached.

The preceding description has been presented with  
reference to a presently preferred embodiment of the  
25 invention shown in the accompanying drawings. Workers  
skilled in the art and technology to which this invention  
pertains will appreciate that alterations and changes in  
the described apparatus and structure can be practiced  
without meaningfully departing from the principles,  
30 spirit and scope of this invention. Accordingly, the  
foregoing description should not be read as pertaining  
only to the precise structures and techniques described,  
but rather should be read consistent with and as support  
for the following claims which are to have their fullest  
35 fair scope.

1 WHAT IS CLAIMED IS:

5 1. An apparatus for breaking eggs comprising:  
egg-holding means for holding a plurality of  
eggs in an array;  
egg-breaking means comprised of a plurality of  
knife means positioned beneath the egg-holding means,  
each knife means comprised of a pair of horizontally  
disposed, vertically oriented knife blades, said knife  
10 blades being movable between a first contiguous position  
and a second spaced-apart position, and movable vertically  
from a lower position spaced from eggs held by the egg-  
holding means to an upper position towards the egg-holding  
means to enable simultaneous breaking of the shells of a  
15 plurality of eggs held by the egg-holding means when the  
knife blades are in the first position, said knife blades  
having openings therein to allow substantially complete  
discharge of the contents of the eggs when the knife  
20 blades are moved to the second position and while in the  
upper position;  
and  
means for collecting the discharged contents of  
eggs broken by the knife means.

25 2. An apparatus as claimed in claim 1 further  
comprising means for separating the egg whites and egg  
yolks of eggs broken by the knife means.

30

35

1           3.    An apparatus for breaking eggs comprising:  
              an egg holder for holding stationary a plurality  
of eggs, on end, in an array;

              egg-breaking means positioned below the egg  
5   holder, said egg-breaking means comprising a plurality of  
knife means, each knife means comprising a pair of  
horizontally disposed, vertically oriented knife blades  
positioned below the egg holder, one blade of the pair  
being fixed and the other blade of the pair being movable  
10 horizontally between a first contiguous position with  
respect to the stationary knife and a second position  
spaced apart from the other knife blade, both knife blades  
being movable vertically from a lower position spaced  
apart from the egg holder to an upper position sufficiently  
15 close to the egg holder to partially crack the shells of  
eggs held by the egg holder when the knife blades are in  
the first position; and

              a receptacle below the knife blades for receiving  
the contents of eggs broken by the knife blades, said  
20 contents being discharged when the movable knife blade is  
in the second position, said knife blades having openings  
therein to enable discharge of the contents of the broken  
eggs.

25           4.    An apparatus as claimed in claim 3 further  
comprising means for supporting the egg holder and knife  
blades at positions above the receptacle.

30

35

1           5.    An apparatus as claimed in claim 3 further  
              comprising spring means for biasing the knife blades  
              toward the upper position.

5           6.    An apparatus as claimed in claim 5 further  
              comprising means for releasably maintaining the knife  
              blades in the lower position.

10          7.    An apparatus as claimed in claim 3 further  
              comprising means for separating the yolks of eggs from  
              the whites of eggs which have been cracked by the knife  
              blades.

15          8.    An apparatus as claimed in claim 7 wherein the  
              means for separating the egg yolks and egg whites com-  
              prises a hollow cone positioned below each egg held by  
              the egg holder and below the knife blades for receiving  
              the contents of an egg broken above the cone, said cone  
20           having an open top, and an interior volume about equal to  
              the volume of an egg yolk so that the egg white received  
              by the cone from an egg broken above the cone will over-  
              flow the cone into the receptacle and the egg yolk will  
              be retained in the cone.

25          9.    An apparatus as claimed in claim 8 wherein the  
              cones comprise an operable bottom and the receptacle  
              comprises means for subdividing the interior of the  
              receptacle into an upper chamber into which egg whites  
              which overflow the cones collect and a lower chamber into  
30           which egg yolks contained within cones can be released  
              through the bottom of the cones when opened.

1           10. An apparatus as claimed in claim 8 further  
comprising a generally cylindrical collar snugly fitted  
around the top edge of each cone, said collar being  
movable vertically from an upper position wherein the top  
5   edge of the collar is above the top edge of the cone and  
the bottom edge of the collar is at or below the top edge  
of the cone and a lower position wherein the top edge of  
the collar is at or below the top edge of the cone.

10           11. An apparatus for breaking eggs comprising:  
            an egg-holder grid comprising a select number  
of egg holders arranged in a predetermined number of  
generally horizontally disposed rows;  
            a knife grid below the egg-holder grid comprising  
15   a pair of horizontally disposed vertically oriented knife  
blades positioned below each row of egg holders, at least  
one knife blade of each pair of knife blades being movable  
horizontally between a first position contiguous with the  
other knife blade and a second position spaced apart  
20   from the other knife blade, said knife grid being movable  
vertically between a lower position spaced apart from the  
egg holder and an upper position sufficiently close to  
the egg holder for the knife blades to simultaneously  
crack the shells of eggs held by the egg holder and when  
25   the knife blades are in the first position, the knife  
blades having an opening therein to allow substantially  
complete discharge of the contents of the eggs when the  
knife blades are moved to the second position while in  
the upper position; and  
30           a receptacle below the knife grid for receiving  
the contents of eggs broken by the knife blades.

            12. An apparatus as claimed in claim 11 further  
comprising means for supporting the egg-holder grid and  
35   the knife grid above the receptacle.

1           13. An apparatus as claimed in claim 11 further  
comprising spring means for biasing the knife grid toward  
the upper position.

5           14. An apparatus as claimed in claim 13 further  
comprising means for releasably maintaining the knife  
grid in the lower position.

10           15. An apparatus as claimed in claim 11 further  
comprising a cone assembly for separating the egg yolks  
and egg whites which is removably fitted into the recep-  
tacle and comprises an intermediate floor extending  
across the receptacle at an elevation spaced-apart from  
the bottom of the receptacle for dividing the interior of  
15           the receptacle into an upper chamber above the intermedi-  
ate floor and a lower chamber below the intermediate  
floor, said cone assembly further comprising a generally  
hollow cone extending through the intermediate floor at  
positions below each egg holder for receiving the contents  
20           of an egg held by the egg holder which is broken above  
the cone, said cone having an open top, an openable  
bottom for releasing egg contents contained therein into  
the lower chamber, and an interior volume about equal to  
the volume of an egg yolk so that the egg white received  
25           by the cone from an egg broken above the cone will over-  
flow the cone and be retained in the upper chamber.

30           16. An apparatus as claimed in claim 15 wherein the  
cones further comprise means for breaking the yolks of  
the eggs as the yolks are released into the lower chamber.



1           17. An apparatus as claimed in claim 15 further  
comprising a collar grid comprising a generally cylindri-  
cal collar fittable snugly around the top edge of each  
cone, said collar grid being movable vertically from an  
5   upper position wherein the top edges of the collars are  
above the top edges of the cones and the bottom edges of  
the collars are below the top edges of the cones and a  
lower position wherein the top edges of the collars are  
at or below the top edges of the cones.

10           18. A method for rapidly breaking a plurality of  
eggs comprising:

          holding a plurality of eggs in a select number  
of generally horizontally extending rows so that at least  
15   the bottom portions of the eggs are exposed;

          positioning a pair of generally horizontally  
extending contiguous knife blades below each row of eggs;

          moving the knife blades upwardly into the eggs  
with sufficient force to break the shells of the eggs and  
20   for the knife blades to extend into the interior of the  
eggs a select distance;

          moving at least one knife blade of each pair of  
knife blades horizontally away from the other knife blade  
to enable the contents of the cracked eggs to flow  
25   downwardly between the knife blades; and

          receiving the contents of the broken eggs in a  
receptacle.

30           19. A method as claimed in claim 18 further com-  
prising separating the egg yolks from the egg whites of  
eggs broken by the knife blades prior to receiving the  
contents of the broken eggs in the receptacle.

1           20. A method as claimed in claim 19 wherein the egg  
          yolks are separated from the egg whites by:

          positioning a hollow cone having an open top  
          below each egg to be broken by the knife blades in said  
5       cones, the egg yolks being retained within the cones, and  
          the egg whites overflowing the cones into the receptacle.

          21. A method as claimed in claim 20 further com-  
          prising:

10           positioning a collar snugly around each cone  
          which extends above each cone sufficiently to contain,  
          along with the cone, the entire contents of an egg broken  
          above the cone, said collar being depressible to a posi-  
          tion below the top edge of the cone; and

15           depressing the collar to a position below the  
          top edge of the cone when the contents of an egg are  
          contained within said cone and collar to allow the egg  
          white portion of the egg contents to gently overflow the  
          cone and collar.

20           22. A method as claimed in claim 20 wherein the  
          cones have an openable bottom and the interior of the  
          receptacle is subdivided into an upper chamber and a  
          lower chamber so that egg whites overflowing the cones  
25       collect in the upper chamber and the egg yolks contained  
          within the cones can be released through the bottom of  
          the cones into the lower chamber and further comprising  
          releasing the egg yolks contained within the cones into  
          the lower chamber and further comprising releasing egg  
30       yolks contained within the cones into the lower chamber.

          23. A method as claimed in claim 22 further com-  
          prising breaking open the egg yolks as the egg yolks are  
          released into the lower chamber.

1           24. An apparatus for breaking eggs comprising:  
            an egg holder for holding a plurality of eggs  
            in an array and in a substantially stationary position;  
            means for simultaneously cracking the shells of  
5           the eggs held by the egg holder to discharge the contents  
            of the egg;  
            a plurality of cone assemblies below the means  
            for simultaneously cracking the shells of the eggs, each  
            cone assembly being positioned for receiving the contents  
10           of the broken egg and for separating the discharged egg  
            yolk and egg white, each cone assembly being comprised of  
            a generally hollow cone having an open top edge positioned  
            to receive the discharged contents of an egg, said  
            generally hollow cone having an interior volume approximately  
15           equal to the volume of an egg yolk so that an egg white  
            received by the cone from an egg broken above the cone  
            will overflow the cone, and each cone assembly having an  
            openable bottom for releasing an egg yolk after the egg  
            white overflows the cone;  
20           a receptacle for receiving the overflowed egg  
            white; and  
            a receptacle, in communication with the openable  
            bottom of each cone assembly for receiving the released  
            egg yolk.

25  
            25. An apparatus as claimed in claim 24 further  
            comprising a collar grid comprised of substantially  
            cylindrical collars, each having a top edge and a bottom  
            edge, said collars being slidably fitted around each top  
30           edge of a cone, said collar grid being movable from an  
            upper position whereby the top edge of the collar is  
            above the top edge of a cone and the bottom edge of the  
            collar is below the top edge of a cone, to a lower position  
            wherein the top edge of the collar is proximate the top  
35           edge of a cone.

1           26. An apparatus as claimed in claim 24 in which  
the egg-holding means has flexible holders to hold the  
eggs in a substantially vertical position so that an end  
of the eggs is cracked by the knife blades.

5

          27. An apparatus as claimed in claim 24 in which  
each cone includes means to break the yolk of an egg  
passing through the cone.

10           28. An apparatus for breaking eggs comprising:  
          an egg-holder grid comprising a select number  
of egg holders arranged in a predetermined number of  
generally horizontally disposed rows, said egg holders  
holding eggs on end in vertical orientation;

15           a knife grid below the egg-holder grid comprising  
a pair of horizontally disposed vertically oriented knife  
blades positioned below each row of egg holders, at least  
one knife blade of each pair of knife blades being movable  
horizontally between a first position contiguous with the  
20 other knife blade and a second position spaced apart from  
the other knife blade, said knife grid being movable  
vertically between a lower position spaced apart from the  
egg holder and an upper position sufficiently close to  
the egg holder for the knife blades to simultaneously  
25 crack the shells of eggs held by the egg holder and when  
the knife blades are in the first position, the knife  
blades having an opening therein to allow substantially  
complete discharge of the contents of the eggs when the  
knife blades are moved to the second position while in  
30 the upper position;

1 Claim 28, continued. . .

a plurality of cone assemblies below the knife  
grid, each cone assembly being positioned to receive the  
contents of the broken egg and for separating the  
5 discharged egg yolk and egg white, each cone assembly  
being comprised of a generally hollow cone having an open  
top edge positioned to receive the discharged contents of  
an egg, an interior volume approximately equal to the  
volume of an egg yolk so that an egg white received by  
10 the cone from an egg broken above the cone will overflow  
the cone, and an openable bottom for releasing an egg  
yolk after the egg white overflows the cone;

a receptacle for receiving the overflowed egg  
white;

15 a receptacle, in communication with the openable  
bottom of each cone assembly for receiving the released  
egg yolk;

a collar grid comprised of substantially  
cylindrical collars, each having a top edge and a bottom  
20 edge slidably fitted around each top edge of a cone, said  
collar grid being movable from an upper position whereby  
the top edge of the collar is above the top edge of a  
cone and the bottom edge of the collar is below the top  
edge of a cone, to a lower position wherein the top edge  
25 of the collar is proximate the top edge of a cone; and

a support means for holding said egg-holder  
grid and said knife grid and containing:

(i) spring means for biasing the knife blades  
towards the upper position; and

30 (ii) means for releasably maintaining the knife  
blades in the lower position.

29. An apparatus as claimed in claim 28 in which  
each cone includes means to break the yolk of an egg  
35 passing through the cone.

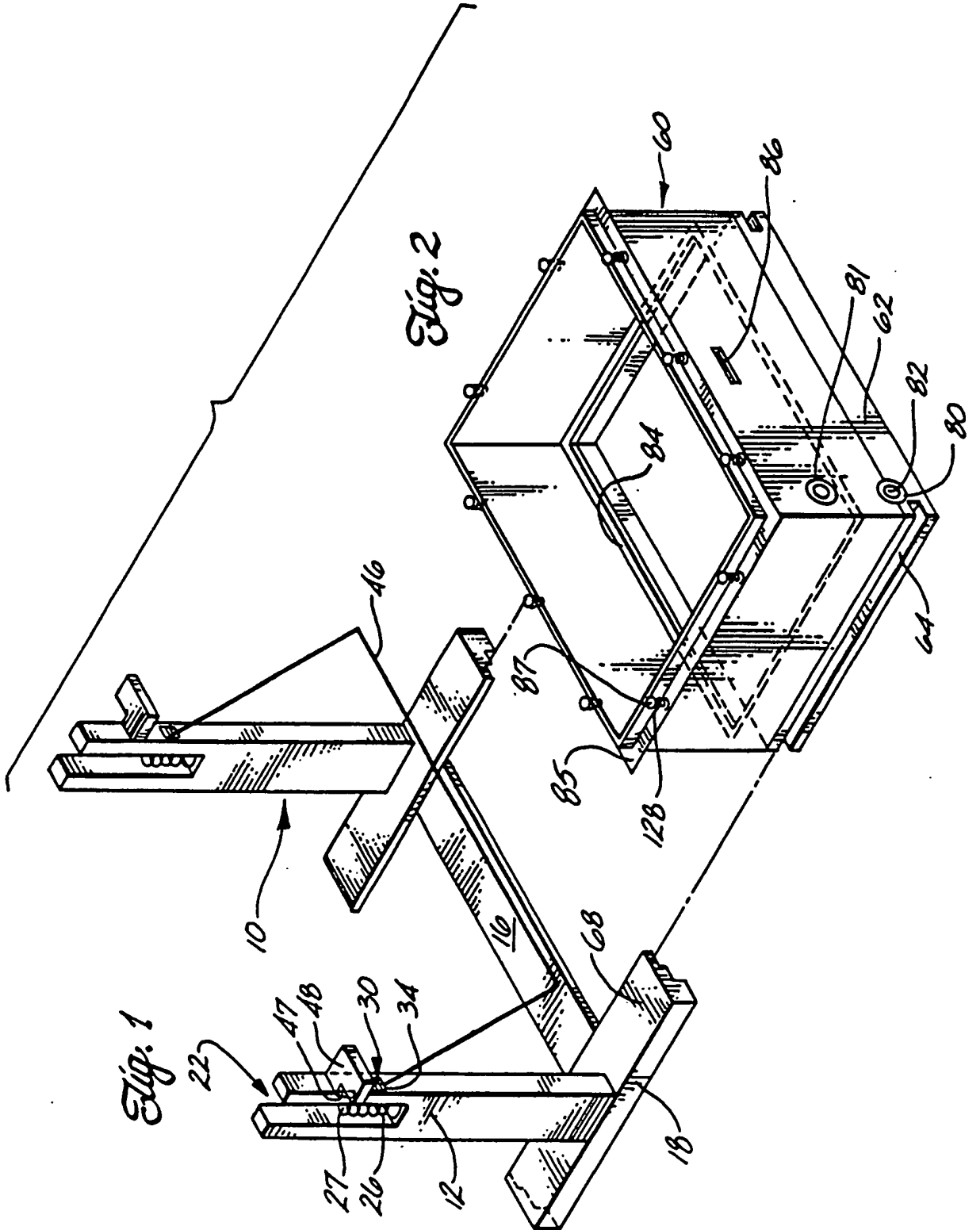


Fig. 1A

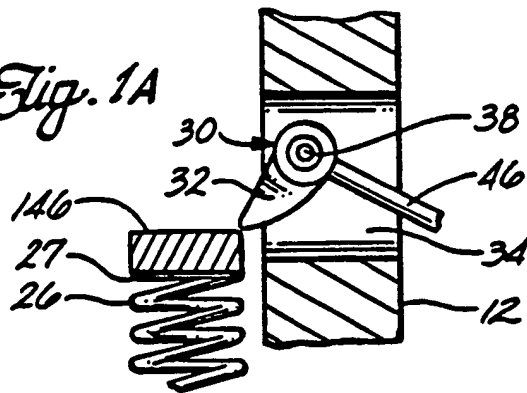


Fig. 1B

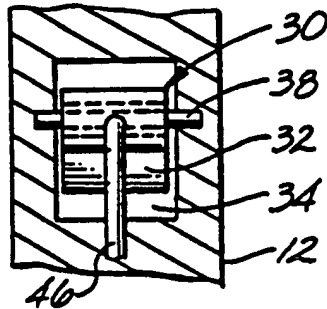


Fig. 4A

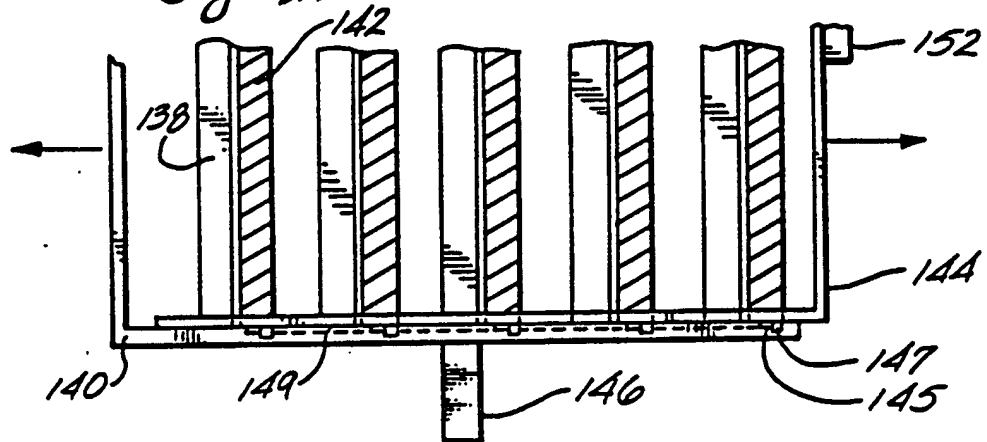


Fig. 4B

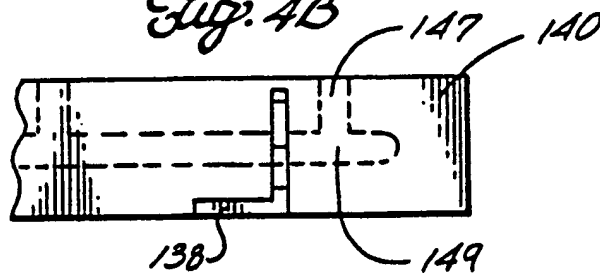
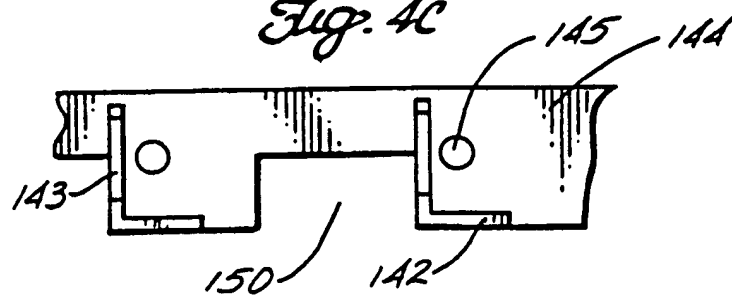
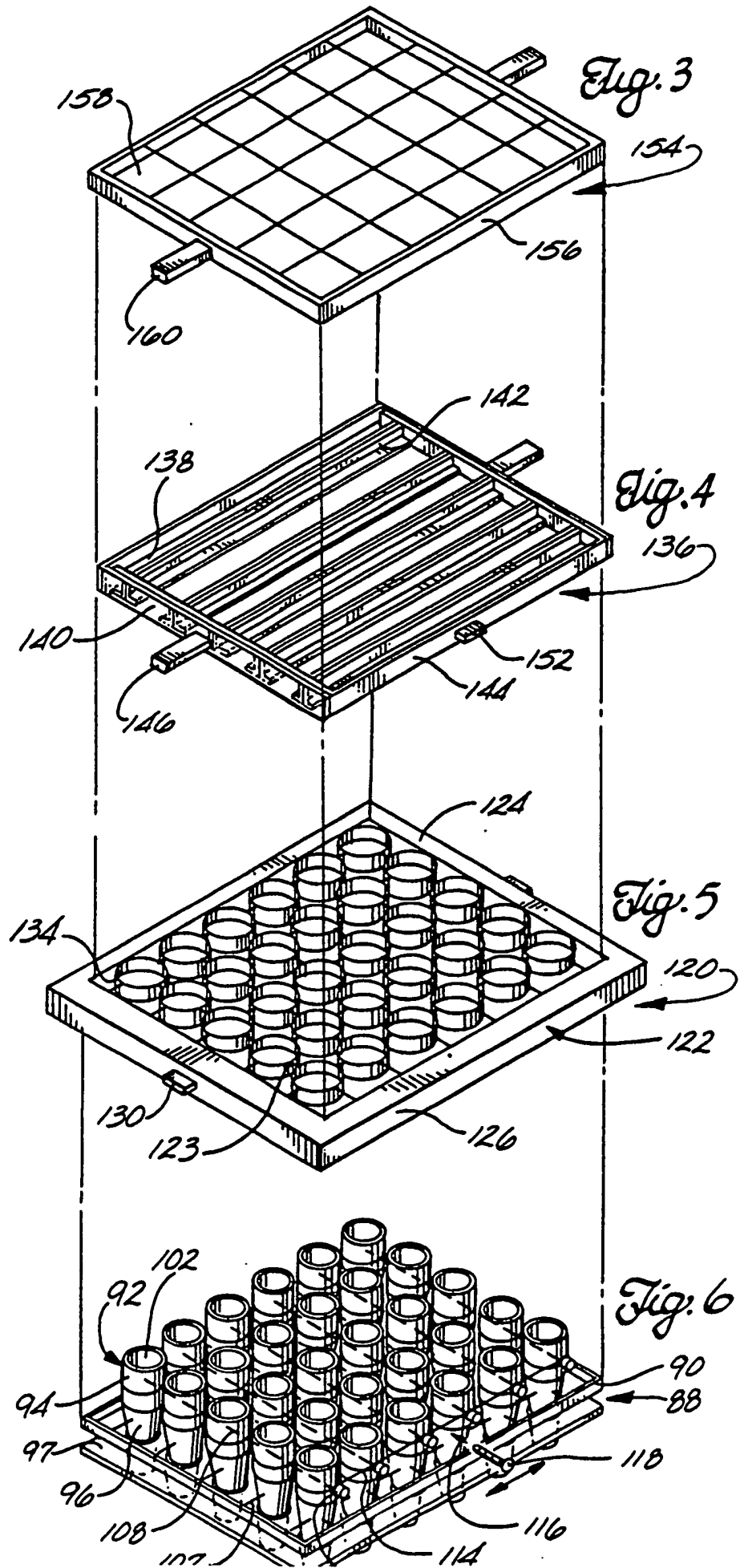


Fig. 4C







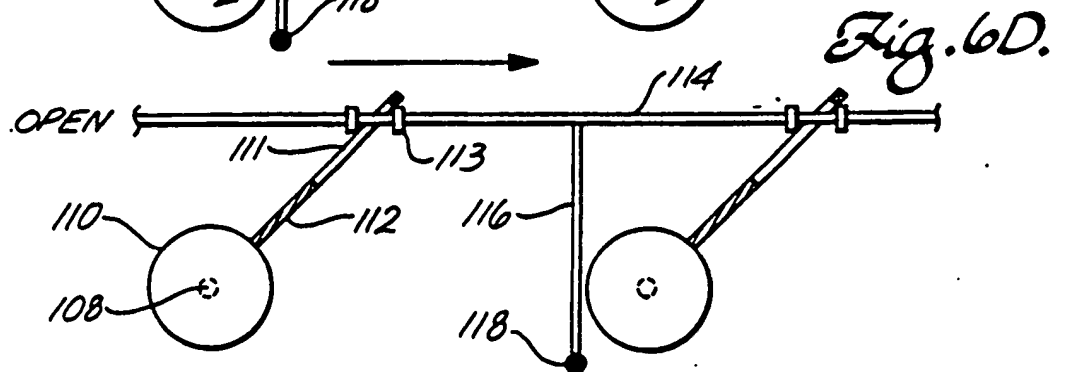
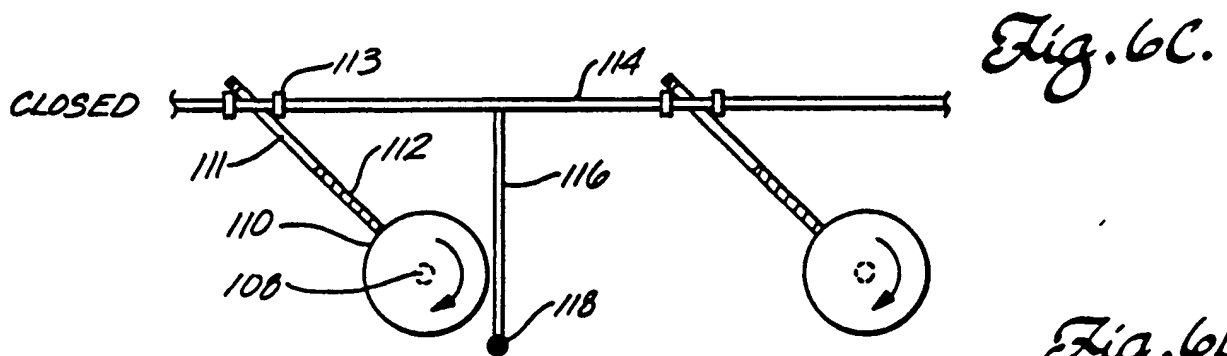
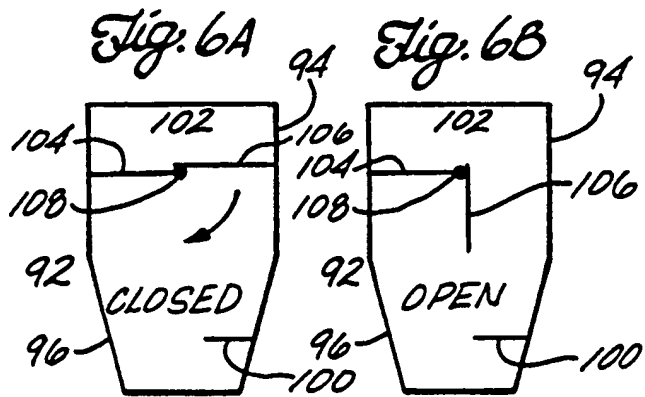
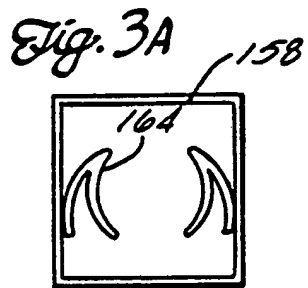
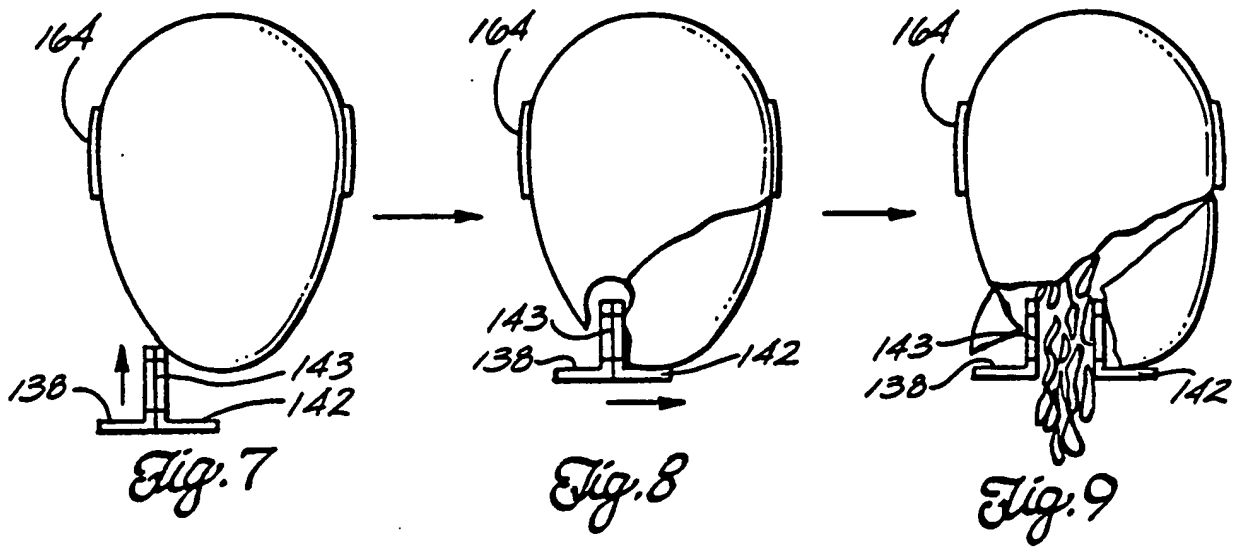


Fig. 10A

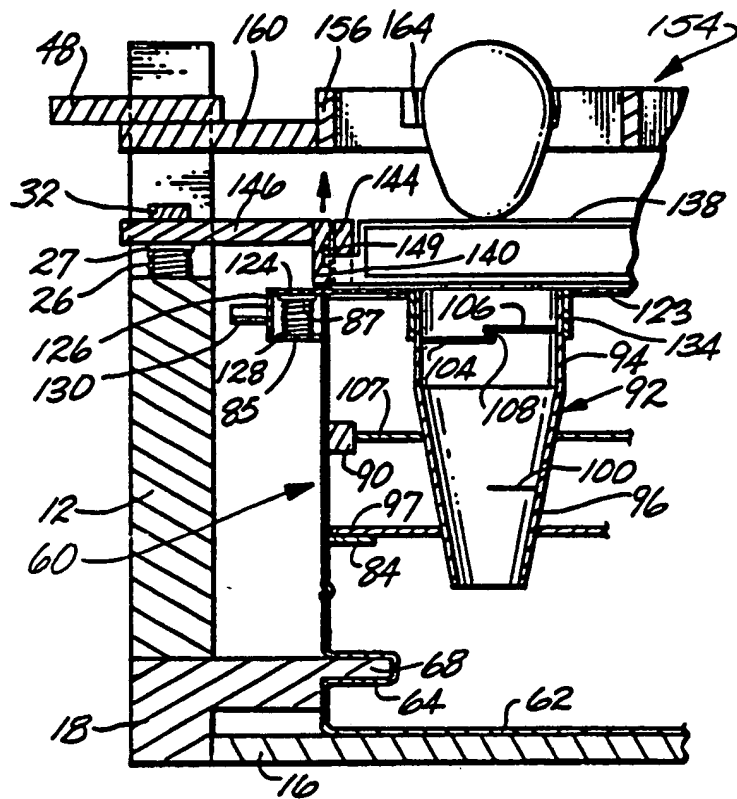


Fig. 10B

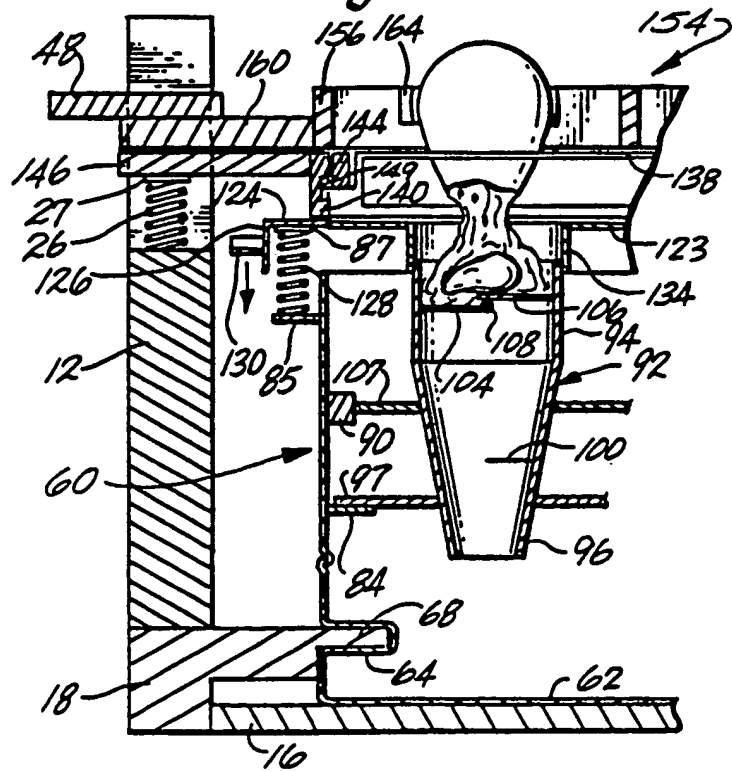


Fig. 10C

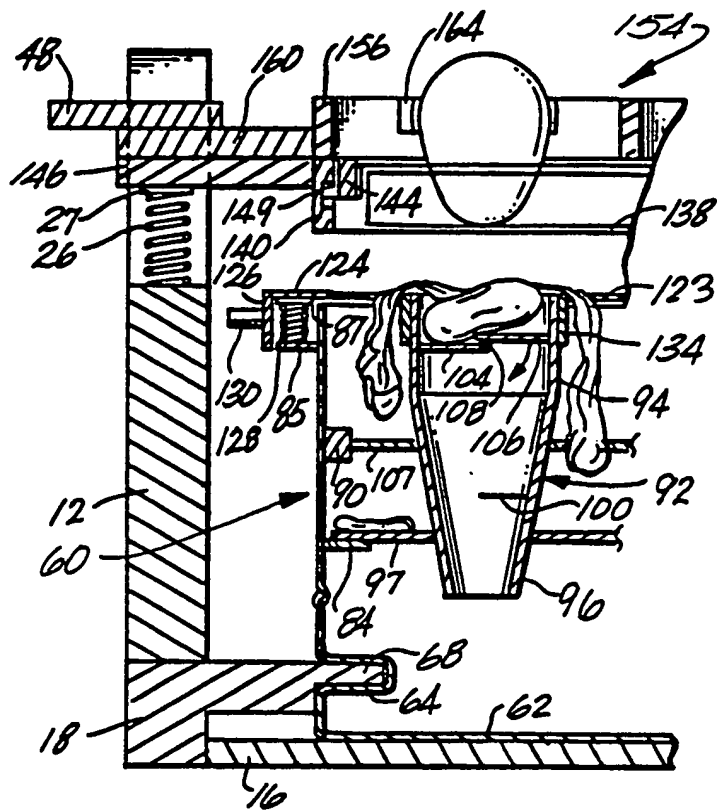
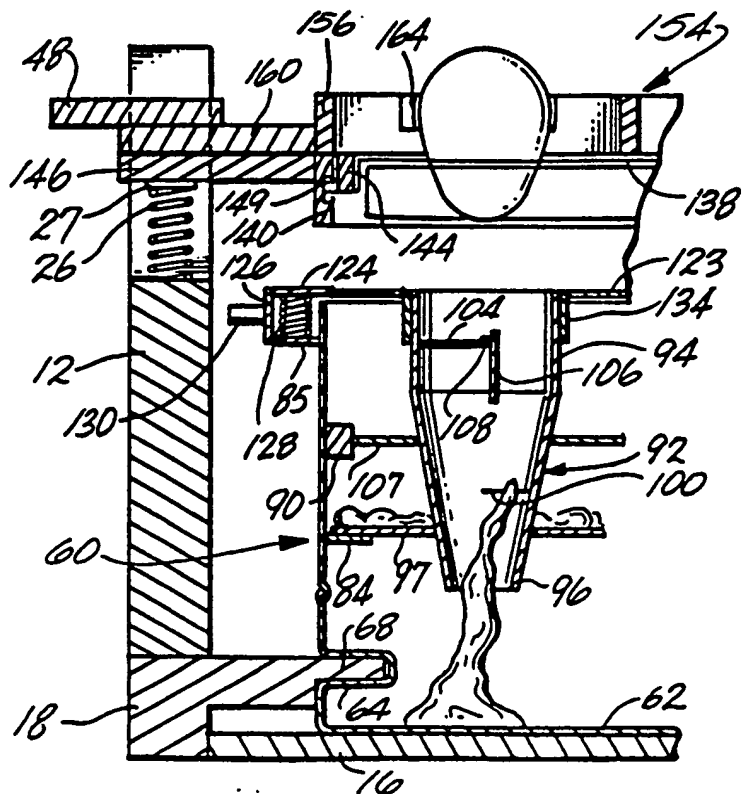


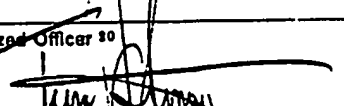
Fig. 10D



# INTERNATIONAL SEARCH REPORT

PCT/US85/02336

International Application No

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>3</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
INT. CL. <sup>4</sup> A23J 1/09		
U.S. CL. 99/499,497 426/299		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>4</sup>		
Classification System	Classification Symbols	
U.S.	99/497-500, 496, 537, 568, 495, 577, 578, 581, 582 30/120.1 426/298-300, 490, 495, 478-480	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>5</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup>		
Category <sup>*</sup>	Citation of Document, <sup>15</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
A	US, A, 2,813,800, Published 19 November 1957 (Rasky)	18-23
A	US, A, 3,137,330, Published 16 June 1964 (MacLagan)	1-17, 24-29
A	US, A, 3,147,783, Published 8 September 1964 (Noltes)	1-17, 24-29
A	US, A, 3,470,925, Published 7 October 1969 (Noren)	1-17, 24-29
A	US, A, 3,613,756, Published 19 October 1971 (Snyder)	18-23
A	US, A, 4,082,856, Published 4 April 1978 (Zwiép et al)	18-23
A	US, A, 4,137,837, Published 6 February 1979 (Warren)	1-29
A	US, A, 4,167,138, Published 11 September 1979 (Warren)	1-29
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>*</sup> Special categories of cited documents: <sup>16</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search <sup>1</sup>	Date of Mailing of this International Search Report <sup>2</sup>	
6 February 1986	13 FEB 1986	
International Searching Authority <sup>1</sup>	Signature of Authorized Officer <sup>20</sup>	
ISA/US	T. Simone 	

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